5. Depth of Ballast:

The depth of ballast under the lowest rail shall be eight (8) inches minimum for timber ties and twelve (12) inches-minimum for concrete ties. Structures shall be designed to accommodate thirty (30) inches of ballast for future track raises.

6. Drainage:

The top of concrete ballast trough for steel beams or multiple girders shall be sloped transversely not less than 1%. Low 'points on top of the trough shall be located not less than 6'-0" from the centerline of any track and shall be within the outside beams or girders.
A longitudinal collection system shall be provided to dispose of drainage without permitting it to enter the ballast section and backfill beyond the limits. of the bridge structure.

All concrete ballast troughs shall be sloped'transversely not less than 1%. A longitudinal collection system shall be provided on top of waterproofing along the face of parapet or curb to drain water. Longitiudinal'drairis shall be connected to the storm drain system or properly discharged 'at the toe of embankment slopes. See drawing UP13, Appendix A for details.

han approach grade descends toward the bridge, drainage from the approach shalt, be intercepted by appropriate means so that it will not drain. onto the bridge.

7. Waterproofing and Protective Panels:

Waterproofing and protective panels shall comply with the recommendations of Chapter 29 of the AREA Manual. The waterproofing shall be one layer of Butyl Rubber or EPDM membrane and shalt be bonded to the bridge deck with adhesive applied to the entire surface in accordance with the recommendations of the membrane manufacturer. Butyl Rubber or EPDM membrane shall be 0.06" thick minimum. Field splices shall be the tongue and groove type per AREA Chapter 29, Part 2, detail No.3 Figure 2-2.

protective asphaltic panels shall be in two layers with total thickness not less than 3/4 of an inch and shall be laid with joints staggered; Protective panels shalt be bonded to. the membrane and to each other with the same adhesive.. used foi' bonding the membrane and be compatible to materials.
For waterproofing details see drawings UP14 .and UP15 Appendix A'

XVI ABUTMENTS

The abutments shall be designed in accordance with the recommendations of Chapter 8, Part 5 of the AREA Specifications.
The abutments shall be wide enough to satisfy Union Pacific Railroad Company standard roadbed shown on drawings 0001 and 0002, see Appendix A For multiple track bridges, the abutment'width shall be sufficient to provide for standard shoulder, plus 20 ft. for each existing or future track.

Wingwalls shall be designed to support 2 :1 embankment slopes.

Handrails for ballast trough shall be returned on the backwall and or wingwalls.

Provide a minimum edge distance of six inches from edge of the masonry plate, or bearing to edge of concrete.

Slope top of abutment seat to drain. If weattiering steel is used for superstructure, details on top of abutment seat should indicate method of collecting and disposing of water without staining concrete surfaces.

XVII P I E R S

Provide a minimum edge distance of six inches from edge of masonry plate or bearing to edge of concrete.

Provide a minimum of 18 inches beyond the outside edge of, outermost masonry plate or bearing to end of the pier.

Single column piers should not be considered for underpass structures. Piers with a minimum of two columns should be provided. A solid pier wall with minimum of four (4) ft. thickness Is preferable.

Slope top of pier to drain. If weathering steel is used for superstructure, details on top of pier seat should indicate method of collecting and disposing of Water without staining concrete surfaces.

Bridge piers adjacent to roadways shall be protected from vehicular traffic as required, per AASHTO and. States DOT standards.

XVIII STRUCTURE SEPARATION

In order to satisfy maintenance requirements, parallel structures shall have a minimum separation of five (5) ft..

XIX DRAINAGE

Maintaining the existing drainage arid providing for future drainage improvements 'is of the utmost importance; Existing track ditches must be maintained at all times.

Drainage plans must be included with the general plans submitted to the office of the Chief Engineer Design for' approval. These plans must include hydrologic computations, indicating the rainfall intensity and duration of the. design storm used, as well as the method of analysis.

Where project design calls for an increase in the. flow through the railroad embankment, the flow shall be handled.by means of separate drainage structures.

When'the proposed construction will change the quantity and/or character of flow in the track ditches, the ditches 'shall be modified as required to handle the drainage. Ditches shall be designed In accordance with good engineering practices. A 50 and 100 year event study will be required along with the water surface elevations.

Approval of the drainage plan does not relieve the submitting 'agency and/or designer of ultimate respdnsibility and liability for a satisfactory drainage design.

XX SEQUENCE OF CONSTRUCTION

It is essential that the construction be performed with a minimum interference with rail traffic. Continuity of safe rail operations will be required for the duration of t h e project.

The most effective method of maintaining traffic is to temporarily re route rail traffic around the construction site using detour tracks. Shoofly shall be designed to comply with current rail operations and existing conditions Designer shall submit shoofly design for review by the office of Chief Engineer Design in. the early stages of project design; Submittal for review of shoofly shall be directed to the Manager, Industry and Public Projects. Minimum three sets of plans required.

The use of shoofly for construction of permanent structure will minimize the traffic interference with the railroad operations; however,' if construction requires interruption of rail traffic or track time windows this shall require the approval fro the local Service Unit Superintendent of the area. No design should advance without

such, approval. Prior to start of any construction on Railroad's right-of-way, written approval permits shall be secured from Contracts and Real Estate Department.

The agency should contact the Manager, Industry and Public Projects in the preliminary design stages of design to determine the Railroad's operation&l requirements..

XXI CONSTRUCTION EXCAVATION

Excavations for construction of footings, piers, columns, walls or other facilities that require shoring to support active tracks shall comply with requirements of Union Pacific Railroad standard drawing 106613 "General Shoring Requirements" see Appendix A. Also design and. construction shall comply, with requirements of 'Union Pacific Railroad "Guidelines for Design and Construction of Shoring Adjacent to Active Tracks"..

XXII EROSION CONTROL

The general plans for the bridge shall indicate the proposed methods of erosion control and must specifically address means to prevent silt accumulation in the ditches and culverts and to prevent fouling the track ballast, sub ballast and existing drainage system. If 'the plans do not show erosion control, the contractor must submit a proposed method of erosion control and have the method approved by the,, office of the Chief Engineer Design prior to beginning any grading on the; project site.

Existing track'ditches shall be maintained at all times throughout the construction period. After the construction has been completed, all erosion control devices must be removed, all deposits of silt removed, and ditches be restored;

Agency or Contractor shall furnish to Railroad all copies of Storm Water Plans and approved permitting if required:.

Approval of the erosion control plan does not relieve the submitting agency and/or designer, and contractor of the ultimate responsibilityand liability for a, satisfactory erosion control plan.

XXIII CONSTRUCTION MANAGEMENT TEAM REQUIREMENTS

For construction of grade separation underpass structures an experienced." Construction Management Team will be required during the construction of bridge structure. Public agencies with qualifying bridge structure staff that can be placed on site during the construction shall be acceptable; otherwise a qualifying outside team must be obtained.

following are minimum requirements for Construction Management Team:

1. Agency to submit names of personal to be used in the project and their assigned duties.

2. Provide list of projects for each person that has actively worked on; including bridge structures (highway or rail), underground facilities, and drainage structures.

3. Provide verifiable list of employment including a current resume for each person in the Construction Management Team.

4. Minimum personnel for Construction Management Team for a typical grade separation underpass structure will consist of:

   a) Project Manager

   b) Resident Engineer - The resident Engineer for the project shall be a registered Civil Engineer with minimum 5 years experience in the field of bridge construction work..

   c) Construction Inspector - Construction Inspector to be familiar with concrete and steel construction and have current certifications in, the fields that he will be inspecting.

5. All field members of Construction Management Team are required to have passed the Union Pacific Railroad Company Track Safety and Bridge Pall Protection class.

6. All submittals by the contractor shall be reviewed by the management team and then submitted to the project Design Engineer. After review is completed. and found satisfactory by the Design Engineer material shall bo submitted to the Railroad for further review and comments (Reference the sectiontitled REVIEW SUBMITTALS). No work shall be performed inside the Railroad "right-of-way without prior review by the Railroad.

XXIV REVIEW SUBMITTALS

Submittals for design and construction of Grade Separation, projects shall be coordinated and submitted through the Manager of Industry and Public Projects of the region in which the project is located. To expedite reviews, submittals must be complete, clearly explained and orderly. Design review for underpass structures shall be reviewed by the Manager of Structures Design in the office of the Chief Engineer Design and/or through an outside consultant at the expense of the owner. Prior. to' any review,, Manager of Industry and Public Projects shall receive authorization from the agency agreeing to pay ail review costs for the design and construction, phases of the project. Once such' an agreement is established, Manager of Industry and Public Projects shall request and secure an internal Work Order to cover review expenses. Review expenses shall include all costs for in-house personnel and/or consultants retained by the Railroad. Manager of Industry., and Public Projects shall advise the agency of the anticipated costs to be incurred during the plan review process and construction monitoring phase of the project. If the estimated costs are determined to be insufficient to cover said costs, the owner will be advised. The original estimated costs will not be the upper limit of the costs but will provide a guideline for budgeting purposes.' Regardless, all reasonable costs incurred by the Railroad during the plan review process and construction. monitoring phase of the work will be fully recoverable from the agency.'

1. Preliminary Plan Submittal

Preliminary conceptual underpass bridge plans shall include the following:,

a) Plan view 'of proposed bridge structure and location of all existing' facilities and utilities within the Railroad Right of Way., Plan view to indicate the spanlengths, the alignment and skew angle of abutments and piers, site drainage, etc..

b) Elevation view indicating the abutment and pier elevations, track eievation to top of rail existing and proposed, minimum vertical clearance above roadway, footing elevations, type of footings, location. of existing and/or relocated utilities, site drainage, etc.

c) Typical superstructure cross section showing deck 'and pier outline; if applicable, horizontal and vertical dimensions of deck structure, rail and ballast structure, waterproofing material, deck drainage, track spacing, horizontal clearances, railing, etc.

d) Existing and proposed track profile at the bridge location and at least 1000 ft. past the bridge ends.

e) Existing and proposed alignment including the proposed shoofly alignment design data.

f) General notes to indicate structure design criteria, construction methods, material compliance specifications, and construction sequencing.

g) Plans shall identify and specify the relocation of all utilities.

h) Bridge genera; plan shall show the location of shoofly and indicate the footprint of structure in relation to centerline of shoofly. Minimum distances and location of shoring if required shall be shown on the general plan.

i) Fiber optic cables are presently buried on the Railroad right-of-way or if such installations are scheduled; the presence of such facilities shall be considered in the project design and appropriate measures for the installation and protection of the fiber optic cables shall be addressed in the plans and contract documents.

Four sets of preliminary plans shall be submitted to the Manager of Industry and Public Projects. Allow three (3) weeks for in-house review by the Manager of Structures Design from the time plans received. All replies shall be returned to the Manager of Industry and Public Projects for handling, with the agency.

2. 60% Plan Submittal

Submittal of 60% plans shall include a minimum of the following:

a) Complete design of superstructure and substructure

b) Bridge details.

c) Bearing details.

d) Deck and waterproofing details:

e) Geotechnical reports/recommendations should be submitted. with professional seals and signatures.

f) Complete set of structural calculations shall be made available at the time of the submittal. Computer run output or data sheet calculations shall be supplemented with sample calculations and clearly defined sketches. All assumptions shall be clearly, indicated. Structural. calculations should be submitted with professional seals and signatures.

g) Hydraulic 'calculations if drainage is affected.. Hydraulic calculations submitted should be submitted with profetional seal and signatures.

h) Complete shoofly de&n.

i) Final construction sequence.

Four (4) 'sets' of 60% plans, two (2) sets of Structural calculations, and two (2) sets of soil reports shall be submitted to the Manager. of industry and Public Projects. After preliminary review, the submittal will then be forwardedto the Manager of Structures Design. Manager of Structures Design shall have the option of reviewing the project documents in-house or using an outside consultant. If a consultant is used to review the design documents, the consultant and. design engineer will be free to communicate and resolve design issues. Outside consultant will review and reply directly to the agency or their representative after consultation with the Manager of Structures Design. Copy of reply shall be furnished to the Managers of Structures Design and Industry and Public Projects. Allow ten (10) weeks for review.

3. 90% Submittal

Plans for 90% submittal shall Include the following:

a) Revisions to plans and calculations as dictated& review of the 60% submittal. Revisions to plans and calculations should be resubmitted with professional seals and signatures.

b) Project Special Provisions.

Three (3) sets of 90% plans, two (2) sets of structural calculations, two (2) sets of hydraulic calculations, and three (3) sets of special provisions shall be" submitted.' All material shall be submitted to the Manager. of Industry and Pu bli c Projects for preliminary review. The documents, will then be transmitted to the.

Manager of Structures Design for further handling. Four (4) weeks shall be allowed for review:. If a consultant is used to review the 90% submittal, the consultant and design engineer will be free to communicate and resolve remaining design. issues. The consultant shall review and reply directly to the agency or their representative after consultation with the Manager of Structures Design, Copy of reply shall be furnished to the Manager of Structures Design as well as the Manager of Industry and Public Projects.

4. Final'Submittal

Final submittal shall include the following:

a) Plans signed and sealed by professional registered project engineer in the state of the project.

b) 'Final calculations will be.signed and sealed 'by professional registered, engineer in the state of the project.

c) Final S i g n e d hydraulic calculations.

d) Final signed special p r o v i s i o n s .

Three (3) sets of 100% *signed* plans, one (1) set Of *signed* Structural calculations, one (1) set of *signed* hydraulic calculations, and. two (2) sets of *signed* special provisions shall be submitted. All material shall be submitted to the Manager of Industry and Public Projects who will forward them to the Manager of Structure Design. Three. (9) weeks shall be allowed for review. If consultant is used for the review process, consultant and design engineer will be. free to communicate and resolve all remaining'design issues. When, review is complete, the Railroad or its representative (consultant) 'shall 'advise the agency or their representative that: all issues have been addressed satisfactorily and recommending, the release of structure for construction. Copy of reply shall be mailed to. the Manager of,, Structures Design as well as the Manager of Industry' and Public Projects.

5. Construction Submittals

During construction of the underpass bridge structure, the Railroad requires the review, of material data sheets to determine compliance with the specifications. It is required that product information for all material specified in the table below be Submitted by the agency or their representative to the Union Pacific Railroad Company for review following their own review and approval of the 'material. The *signed* submittal will then be forwarded to the Manager of Industry and Public Projects who in turn will send them to the

Manager of Structures Design: Manager of Structures Design shall perform or have an outside consultant review said submittals. If a consultant performs said 'review 'the. consultant may reply directly. to the agency or-their representative after consultation with the Manager of Structures Design. 'Copy of reply shall be mailed to the Manager of Structures Design as well as to the Manager of Industry and Public Projects. During the review process the consultant and design engineer will be free to communicate and resolve issues. Review of material submittals will require minimum of three (8) weeks. Following is list of material submittals:

ITEM	REVIEW SUBMITTAL	SETS REQD.	NOTES
1	Shop drawings	2	Steel and Concrete members
2.'	Bearings	2	For all structures"
3	Concrete Mix Designs	2	For superstructure only
4	Rebar & Strand certifications	2	For superstructure only
5	28 day concrete strength	2	For superstructure only
6 '	Waterproofing material certification	2	Waterproofing & protective boards
7	Structural steel certifications	2	All fracture. critical members
8	Test reports	2	All fracture critical members
9	Foundation Construction Reports	2	Piie driving, drill shaft.. construction; bearing pressure' test reports for spread footings'

6. Site inspectidlis during construction

In addition to the office reviews, site inspections will be performed at significant points during construction, including following if, applicable:..

1. Preconstruction meeting.
2. Acceptance inspection of any shoofly structure before placing it in service.
3. Reinforcement end concrete placement for main bridge substructure and/or superstructure.'
4. Steel erection for main bridge structure.
5. Post-tensioning of main bridge.
6. Erection of precast concrete bridge superstructure.
7. 'Acceptance of waterproofing (prior to placing ballast); . . .
8. Final inspection and acceptance of the bridge. structure.

Site inspection Is not limited to the milestone events listed above; rather site visits to check progress of the work may be performed at any time throughout the construction as deemed necessary by the Railroad.

A construction schedule shall be provided to the Manager of Structures Design, Union Pacific Railroad Company, 1416 Dodge Street, Room1000, Omaha, NE 68179. Phone (402) 271-6234 or FAX (402) 271-3296 to inform the Manager of Structures Design of the anticipated dates when the listed events will occur. This schedule shall be updated as necessary' but at least monthly so that site visits may be: scheduled.

7. As Built Submittal :

The owner or their representative is required to submit AS BUILT documents to Union Pacific Railroad Company at the completion of the bridge structure prior to closing project. Following is list of these documents:

ITEM	AS BUILT	SETS REQD.	NOTES
1	Design Plans	1	Final as built bridge plans only
2	Shop drawings	1	Final plans only

As built design and shop drawings to be in Mylar foim or electronic files. . . . As built documents to be mailed to the Office of Chief Engineer Design,, 1416 Dodge Street, Room 1000, Omaha, NE 68179

UNION PACIFIC RAILROAD COMPANY

UNDERPASS GRADE SEPARATION DATA SHEET

1. **Location:** _____ _____ _____
   City County State

2. **Distance** from **nearest** Milepost **to centerline of Bridge:** _____

3. **Railroad** Subdivision: _____

4. Description of project: _____

5. **Utilities on Railroad** Property:

Name	**Any** Adjustments Required?	Contact Person

6. **List all the** at-grade crossings **that will be eliminated by the construction** of **this** grade separation;

DOT #	Milepost	Signalized?

7. How many spans are proposed? _____

9 . off&t to temporary detdur alignment: _____

9. Temporary detour alignnient:

On Embankment, trestle, 'or, both? _____

10. Drainage:

Describe how drainage, from roadway is handled: _____

_____

_____

_____

_____

_____

Describe how drainage from bridge is handled: _____

_____

_____

_____

_____

11. Scheduled letting Date: _____

ALL INFORMATION ON THIS DATA SHEET TO BE FURNISHED BY SUBMITTING AGENCY TO THE MANAGER OF INDUSTRY AND PUBLIC PROJECTS.

APPENDIX A

ITEM	DRAWING
Steel Deck Plate Girder Span with Concrete Deck	UP1
Steel Beam Span' with Concrete Deck	UP2
Prestressed Concrete Box Girder Span with or without Concrete De&	UP3
'Prestressed Concrete AASHTO Type Beam Span with Concrete Deck	UP4
Cast-in-Place Concrete Box Girder Span 'Conventional Reinforced.	UP5
Cast-in-Place Post-tensioned Concrete Box Girder. Span	UP6
Steel Through Plate Girder Span with Concrete Deck	UP7
Steel Through Plate Girder Span with Steel Deck	UP8
Bon&g Details for Multiple Prestressed Precast Concrete Girders	UP9
Chain Llnk Railing Details.	UP10
Tubular Hand Railing Details	UP11
Picket Hand Railing Details	UP12
Deck Drain Detalis	UP13
Flashing Details for Waterproofing	UP14
Waterproofing Details	UP15
Collision Impact Devise and, Sacrafitial Beam	UP16
Double Inside Guard Rail for Timber Ties	4005
Double Inside Guard Rail for Concrete Ties	4015
Roadbed Section for Wood Ties Track Construction	0001
Roadbed Section for Concrete Ties Track Construction	0002
General Shoring Requirements	106613